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HANDLING NORTHERN WHITE-CEDAR STANDS  
FOR WOOD AND WILDLIFE IN THE LAKE STATES

By Paul O. Rudolf, Silviculturist

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Native to the region from Nova Scotia to Manitoba, and south to Minnesota, Indiana, New Jersey, and in the Appalachian Mountains to North Carolina and Tennessee -- chiefly on calcareous soils -- northern white-cedar (Thuja occidentalis L.) is a medium-sized tree (usually not over 60 feet tall), commonly used for telephone poles and fence posts. In Minnesota it is common in the northern portions of the coniferous forests.

Northern white-cedar usually grows in wet situations, where it often forms dense pure stands. It also occurs in swamp stands in mixture with balsam fir, black spruce, and tamarack; or with balsam fir, paper birch, aspen, and black ash. On uplands, northern white-cedar is found with white spruce, hemlock, yellow birch, red maple, balsam poplar, balsam fir, and occasionally with white pine, jack pine, or sugar maple. It is not common in acid bogs. Occasionally it occurs on drier ground and even on bare rocks.

Northern white-cedar does best in comparatively shallow swamps where the peat is of a woody character and well drained. Swamps with water movement are best for cedar. Those with still water gradually convert to black spruce and tamarack. White-cedar also does well on limestone outcrops. In the northeast it grows faster on old fields than in swamps.

The northern white-cedar type occupies about 1-2/3 million acres in the Lake States, over 1/2 million acres in Minnesota. About one-third the area is poorly stocked or denuded; over one-third is in seedling and sapling stands (the size most useful for deer browse); and less than one-third is of pole or saw-timber size (Table 1).

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1/ Presented before meeting of Pittman-Robertson personnel of Minnesota at University Farm, January 6, 1949.

2/ Maintained by U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota, at University Farm, St. Paul 1, Minn.



Table 1.-- Commercial forest area in northern white-cedar type - 1945

State	Total	Saw-timber areas <u>1/</u>	Pole-timber areas <u>2/</u>	Seedling and saplings at least 40 per- cent stocked	Poorly stocked and denuded areas
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Minnesota	550,000	40,000	130,000	180,000	200,000
Wisconsin	295,000	30,000	53,000	90,000	122,000
Michigan	784,000	93,000	133,000	354,000	204,000
Lake States	1,629,000	163,000	316,000	624,000	526,000

1/ Lands with at least 2,000 board feet of merchantable saw timber per acre, mostly in trees over 9 inches d.b.h.

2/ Lands with from 3 cords to 2,000 board feet of merchantable wood per acre, mostly in trees from 5 to 9 inches d.b.h.

In the Lake States the northern white-cedar type is a little more abundant than tamarack but less so than black spruce. (Table 2) In Minnesota white-cedar is the least abundant of the three swamp conifer types.

Table 2.-- Area of swamp conifer types in the Lake States - 1945

Type	Minnesota	Wisconsin	Michigan	Lake States
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Spruce swamp	2,010,000	488,000	577,000	3,075,000
Tamarack	980,000	306,000	307,000	1,593,000
White-cedar	550,000	295,000	784,000	1,629,000
Total	3,540,000	1,089,000	1,668,000	6,297,000

Northern white-cedar is important not only as a source of decay-resistant wood, but also as a producer of winter browse for deer and other animals, for ornamental planting and hedges, for production of wreaths and decorations, and for medicinal purposes.

#### GROWTH AND YIELD

Northern white-cedar is usually quite slow growing. It takes from 60 to 200 years to grow a 6-inch tree, depending on site quality; from 30 to 60 years to grow 7-foot posts; from 40 to 110 years to produce merchantable poles; from 50 to 120 years to produce 8-foot ties. A fully stocked stand on an average site (50-foot site index), at 100 years, will have about 700 trees per acre over 0.1 inch d.b.h., averaging about 7 inches in d.b.h., 40 feet in height, 186 square feet in basal area, 3,400 cubic feet in total volume, or 2,750 cubic feet merchantable volume, 6,200 board feet Scribner volume, 370 poles plus 541 posts or 1,800 posts, or 40 8-foot tie cuts (4). In swamps it will produce between 1/4 and 2/3 cords per acre per year the first 100 years.



## SILVICULTURAL METHODS

### Seeding and Regeneration

Northern white-cedar produces seed quite abundantly beginning at an age of about 20 years. Commercial seed production, however, does not begin until about 30 years and is best after 75 years. Good seed crops are borne about every 5 years, with light to medium crops in the intervening years. The cones ripen and the seed is dispersed in August to October. The seeds average 346,000 per pound, 80 percent in purity, and 75 percent in soundness. Natural germination usually occurs in May or June of the year following dissemination, and is best in shady places on moist materials, such as rotten wood, decayed litter, peat moss, or mineral soils. However, regeneration after fires is also often quite good. After logging, regeneration is usually best along skid trails. It is seriously retarded by slash accumulations. Average germination is about 45 percent. The seedlings do best on neutral or slightly acid soil, but will grow on slightly basic soil. Some regeneration, particularly in sphagnum swamps, is from layers. Barring excessive animal populations or changes in water levels, natural reproduction of white-cedar usually is adequate.

### Intermediate Cuts

Northern white-cedar often grows in dense stands (8,000 to 10,000 trees per acre, in 20- to 30-year-old stands, are not uncommon). To improve growth such stands should be thinned. Not much research has been done on this aspect of management. Some plots were established by CCC technicians on the Chippewa National Forest, but no results are available. Three series of plots were also established on the Marquette National Forest in upper Michigan from 1935 to 1937. The results (6), indicated favorable response on good sites, but not much on poorer sites. On medium or better sites, white-cedar responds quite well to release even at fairly advanced ages.

Selection thinnings in upland northern white-cedar have been recommended in Maine (3).

Since white-cedar is normally shallow rooted, intermediate cuttings should not expose the trees too heavily to wind action. Where markets for small material are available, thinning from below, with little attendant windthrow, has shown promise (8).

### Harvest Cuts

In 1937 some experimental cuttings were made in swamps containing cedar in mixture with such species as balsam fir, black spruce, and black ash, on the Upper Peninsula Experimental Forest near Dukes, Michigan. Clear cutting, strip clear cutting, and partial cutting were made. In the former two considerable brush came in, although there was adequate conifer reproduction (most of it advance growth) to restock the area. The latter resulted in some increase in growth.

Although few formal research results are available concerning the harvest cutting of northern white-cedar in the Lake States, some pertinent observations have been made in upper Michigan (8). These indicate that the best aim is to grow white-cedar in pure even-aged stands. Form, quality, and growth are usually poorer when white-cedar occurs in mixed or uneven-aged stands. Partial cuttings, often result in loss of the largest trees from windthrow. Watson (8) recommends clear cutting



in strips about 75 feet wide and up to 1/4 mile long, leaving uncut strips of at least equal width between them. He has had little windthrow in the uncut strips and has had satisfactory reproduction. In mixed stands he recommends cutting the various species as they mature: poplar or aspen at about 70 years, balsam fir before 90 years, spruce a little later, white birch at not later than 120 years, with white-cedar last. In Minnesota, some of these species probably ought to be cut a little earlier than indicated.

Observations by both game men and foresters in Michigan have agreed that what is good silvicultural practice is also good game management (12). The main thing is to make cuttings in winter (which is usually done anyway) and to string them out as long as possible on adjacent areas. This often means coordination of public and private cuttings. Such practices alone, however, are effective only if the deer population is not excessive. Earlier Aldous (1) recommended gradual selective cuttings which would leave 1/8 to 1/4-acre openings every 1/4 to 1/2 mile in cedar deer yards, where commercial logging was not in process.

Of course, what silviculture can be practiced usually depends on the markets.

#### Enemies

Northern white-cedar has relatively few enemies. The carpenter ant, particularly in Minnesota, often causes considerable damage on the butt end of the stem. Rots occur, but chiefly in overmature stands. Deer can eliminate reproduction and injure young seedlings where they are too numerous. A clipping study made in upper Michigan by Aldous (1, 5) indicated that cedars under 7 feet in height could stand annual browsing of 15 to 20 percent of their foliage without great detriment, but if over 50 percent of the foliage were removed the trees would die within 10 years. Cedars 10 to 15 feet tall withstood even heavy annual browsing with no serious injury or loss of growth.

Recent studies in Wisconsin have also shown that snowshoe hares actually damage cedar more than deer in some localities.

#### Studies Now Under Way

The swamp plots on the Upper Peninsula Experimental Forest will be reexamined from time to time and will yield information on cutting methods in mixed cedar swamp stands. The administrative study plots on the Marquette National Forest in Michigan, and the Chippewa National Forest in Minnesota, are available for further study to determine the effects of intermediate cuts in pure cedar stands.

A study of cedar regeneration is in process by a graduate student (Tom Nelson) at Michigan State College in cooperation with the Game Division of Michigan Conservation Department.

The Game Division of the Michigan Department of Conservation has some exclosures both in the Upper and Lower Peninsulas, and has made experimental cuttings in cedar swamps in such areas as the Cusino Wildlife Experiment Station, Baraga County, and the Pere Marquette State Forest (formerly Luther-Baldwin State Game Area). All these should yield information on both silvicultural and wildlife management practices in white-cedar swamps.



### Studies Needed

Formal studies are needed all along the line to disclose the proper timing, intensity, and methods of both intermediate and harvest cuttings on various sites, and in both pure and mixed stands. Along with the silvicultural operations should go studies of the effects of various cuttings upon wildlife management. A useful first-step would be the compilation of a central directory of all exclosures, giving the location and the agency in charge.



PUBLICATIONS ON MANAGEMENT OF NORTHERN WHITE-CEDAR (Thuja occidentalis)

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(7) Watson, Russell

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